

Investigating the Relationship Between Sleep Quality and Night Eating Syndrome in Overweight Iranian Medical Students

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Background: Night Eating Syndrome (NES) is an eating disorder linked to sleep disturbances, overweight status, and reduced quality of life. This study investigated the relationships among NES, sleep quality, and weight-related issues among medical students at Kermanshah University, a population prone to high stress and irregular routines.

Methods: This correlational analytical study included 353 medical students recruited via quota sampling (2022–2023). Participants completed an online survey comprising demographic data, the Night Eating Questionnaire (NEQ), and the Pittsburgh Sleep Quality Index (PSQI). Data were analyzed using independent *t*-tests, Mann–Whitney *U*-tests, and Pearson correlation via SPSS version 24 to examine associations between NES, PSQI, and BMI.

Results: The study found a low prevalence of clinical NES (0.8%), while 27.2% of students had poor sleep quality and 7.4% were overweight. There was a positive correlation between NES and PSQI global scores ($r = 0.196$, $p < 0.001$), as well as with subjective sleep quality, sleep latency, medication use, and daytime dysfunction ($p < 0.05$). Furthermore, NES was significantly more prevalent among overweight students compared to non-overweight students ($p < 0.01$).

Conclusion: While clinical NES was rare among Iranian medical students, significant correlations were observed between NES, sleep quality, and BMI. Future longitudinal studies are recommended to clarify the causal pathways linking these variables. Additionally, interventions targeting sleep quality and stress management may help reduce night eating behaviors and associated weight outcomes.

Keywords: sleep quality, night eating syndrome, overweight

Introduction

Night Eating Syndrome (NES) is a psychiatric disorder characterized by morning anorexia, evening hyperphagia, and insomnia. Currently, approximately, 1.5% of the general population is affected by this syndrome.¹ NES typically, begins in early adulthood, involves periods of relapse and remission, and is associated with life stressors. Studies indicate that while men and women have the same symptoms of NES, but the syndrome tend to have more negative effects on women.² NES can reduce an individual's quality of life by disrupting eating patterns, circadian rhythms, and sleep.³ NES is associated with obesity, disordered eating patterns, psychological concerns and suboptimal sleep and can exacerbate other condition, such as diabetes or metabolic syndrome.⁴

The mechanisms linking NES, sleep, and weight are complex. Disruptions in the circadian rhythm can alter appetite-regulating hormones, such as leptin and ghrelin, leading to evening hyperphagia and subsequent weight gain. Furthermore, sleep disturbances inherent to NES can disrupt metabolic processes, further increasing the risk of obesity.^{5,6}

Medical students represent a critical population for studying these relationships due to their unique academic environment. High academic pressure, heavy workloads, and irregular daily routines often lead to elevated stress levels

and significant changes in sleep and eating habits. These factors make medical students particularly susceptible to eating disorders and sleep disturbances.^{7,8}

Two studies have previously investigated the relationship between NES, the Pittsburgh Sleep Quality Index (PSQI), and body mass index (BMI) among college students. Yahia et al (2017) collected data from Central Michigan University undergraduate students using the Night Eating Diagnostic Questionnaire (NEDQ), and the PSQI. The results showed that NES was significantly related to reduced sleep duration and students with NES symptoms had poorer sleep quality than those without the syndrome.⁹ Somewhat surprisingly, that study found no significant difference between NES and BMI.

Another study among Palestinian students used the Night Eating Questionnaire (NEQ), and the PSQI. The results found that subjective sleep quality ($p < 0.01$), sleep latency ($p < 0.01$), sleep duration ($p < 0.05$), and daytime dysfunction ($p < 0.05$) were negatively associated with NES. Again, there was no evidence of an association between NES and BMI, sociodemographic variables, or other lifestyle factors.¹⁰

Despite the importance of this topic, there is a lack of data specifically focusing on medical students in Iran. Given the stressful nature of medical education and the potential impact on student health, this study was conducted to examine the relationship between NES, sleep quality, and BMI specifically among Iranian medical student.

Methods

This descriptive-analytical cross-sectional study was conducted at the Faculty of Medicine, Kermanshah University. Participants in this study were medical students at different levels (including basic sciences, pathophysiology, internship, and residency) who completed the questionnaire in 2022. Inclusion criteria included students aged 18 or older who were willing to participate in the study. Pregnant students, students who were breastfeeding, and individuals with a history of psychiatric illness or sleep disorders were excluded from the study.

The battery of questionnaires was prepared for online use using the Digit System. A questionnaire link was created and shared with consented medical student participants.

The study was conducted according to the Declaration of Helsinki and the ethical approval for the study was obtained from the Ethics Committee of Kermanshah University of Medical Sciences (IR.KUMS.MED.REC.1401.096). Participants were assured that their information would be kept confidential, and all completed written informed consent.

Sample Size

The standard formula: $n = P \times (1 - P) \times z^2 / d^2$ was used to determine the required sample size. After adjusting for nonresponse, we calculated the minimum sample size of this study as 352 students. The proportion was based on Krističević et al¹¹ with 11% precision and a confidence level of 95%.

Night Eating Questionnaire (NEQ)

This 14-item questionnaire uses a 4-point Likert scale originally developed by Allison et al (2008),¹² While we began with the NEQ as the foundation for our research, Farhangi (2019), reported a Cronbach's alpha of 73% for the questionnaire in Iran, indicating acceptable internal consistency.¹³ This additional validation demonstrated the NEQ's reliability and applicability across different cultural contexts, reinforcing its suitability for our study.

The NEQ evaluates morning hunger and timing of the first meal (2 items), desire to eat and control over eating behavior both before bed (2 items) and during nighttime awakenings (2 items), percentage of food consumed after dinner (1 item), initial insomnia (1 item), frequency of nighttime awakenings and eating (3 items), mood disturbances (2 items), and awareness of sleepwalking episodes (1 item). Items are scored 0–4, with the exception of item 7.

The total NEQ score is calculated by reverse-coding items 1, 4, and 14. The total score is based on the total scores of all items except item 13. The total score ranges from 0 to 52 (8).

Pittsburgh Sleep Quality Index

We used a psychometrically validated Persian version of the Pittsburgh Sleep Quality Index (PSQI).¹⁴ The PSQI assessed an individual's sleep quality over the past month. Using the PSQI scoring protocol, the questions were grouped into seven component scores, each weighted equally on a scale of 0–3. The seven component subscores included subjective

sleep quality, sleep latency, sleep duration, estimates of habitual sleep efficiency, sleep disturbance, use of sleep-enhancing medication and daytime dysfunction due to sleepiness.

The seven component scores were then summed to provide a global PSQI score between 0 and 21. If the global individual score is five or higher on the PSQI, it suggests poor sleep quality and is associated with significant sleep disturbances. The reliability of the Persian version of PSQI has been assessed and confirmed in previous studies.^{15–18}

Body Mass Index (BMI)

BMI was calculated based on the information provided in the demographic portion of the questionnaire. BMI was calculated by using weight in kilograms divided by the square of the height in meters. Participants with a value equal to or greater than 25 were considered to be overweight.

Statistical Analysis

Statistical analysis was performed using SPSS 25 software. Descriptive statistics were used to describe the variables, including frequency distribution tables, mean and standard deviation calculations, etc. Analytical statistical methods included the independent *t*-test, one-way ANOVA, and Pearson's correlation.

It is important to note that if the assumptions for using the above parametric analytical methods were not met (based on the results of the Kolmogorov–Smirnov test), equivalent non-parametric methods were used, namely the Mann–Whitney *U*-test, Kruskal–Wallis test, and Spearman correlation. The significance level for all tests was set at $p < 0.05$.

Results

Demographics

A total of 353 medical students participated in this cross-sectional study. The vast majority of participants, 98.3% (347 individuals), were Iranian, with only 1.7% (6 individuals) from other nationalities with slightly more females (61.5%; $n=217$) than males. Regarding residence, 86.5% ($n=316$) reported living at home, while 10.5% (37 participants) resided in dormitories. For marital status, most participants were single (85.6%, $n=302$), with a smaller proportion being married (14.4%, $n=51$). The educational status of the participants varied, with 24.1% ($n=85$) studying basic medical science, 12.2% ($n=43$) in physiopathology, 15.6% ($n=55$) in a staging program, 40.3% ($n=142$) serving as interns, and 7.9% ($n=28$) as residents. The age distribution of participants were 27.2% ($n=96$) for ages 18–21, 38% ($n=134$) for ages 22–24, and 34.8% ($n=123$) for those over the age of 25.

Night Eating Syndrome, Sleep Quality, and Overweight Status

The mean score (S.D.) on the NEQ was 14.4 (3.5), with only 0.8% of the 353 participants ($n=3$) scoring >25 to meet the diagnostic criteria for NES.

For sleep quality, the mean global score on the PSQI was 4.8 (2.3) with 27.2% of the 353 participants ($n=96$) having scores above the threshold to indicate poor quality sleep. There was a significant correlation between NES and the PSQI global score; see [Table 1](#). NES was also correlated with the PSQI individual sub-scales and found a significant positive correlation with worse NES scores and poorer sleep quality on the sub-scales of subjective sleep quality, sleep latency, use of sleep-enhancing medication, and daytime dysfunction; see [Table 1](#).

For overweight status, 7.4% of the sample population ($n=26$) had a BMI ≥ 25 and were considered overweight. There was a significant difference between NES and overweight status, with significantly higher scores for those who had a BMI ≥ 25 (14.2) compared to normal-weight students (17.9); see [Table 2](#).

For overweight status and sleep quality, the PSQI sleep quality scores were worse for those who were overweight (6.9) compared to normal-weight individuals (4.6). For the PSQI subscales, there were significant associations between overweight status and subjective sleep quality, sleep latency, sleep duration, sleep efficiency, and daytime dysfunction; see [Table 2](#).

Table 1 Correlation Between Night Eating Syndrome and Sleep Quality in Iranian Medical Students (n=353)

Variables	rs	P-value*
Global PSQI score	0.196	0.001
Subjective sleep quality	0.232	0.001
Sleep latency	0.157	0.003
Sleep duration (in hours)	0.046	0.390
Estimates of habitual sleep efficiency	0.102	0.056
Sleep disturbance	0.005	0.929
Use of sleep-enhancing medication	0.105	0.049
Daytime dysfunction due to sleepiness	0.160	0.003

Notes: *p-value based on Spearman correlation test. Values in bold indicate a $P < 0.05$.

Table 2 Relationship Between Night Eating Syndrome and Sleep Quality in Medical Students of Normal Weight and Overweight Status (n=353)

Variables	Normal Weight Mean (S.D.)	Overweight Mean (S.D.)	U-statistic	P-value*
Night eating syndrome	14.2 (3.2)	17.9 (4.7)	-4.2	0.001
Global PSQI Score	4.6 (2.1)	6.9 (3.7)	-3.6	0.001
Subjective sleep quality	1.1 (0.52)	1.3 (0.84)	-2.1	0.032
Sleep latency	0.85 (0.7)	1.2 (0.99)	-2.08	0.037
Sleep duration (in hours)	0.78 (0.53)	1.4 (0.9)	-4.4	0.001
Sleep efficiency	0.08 (0.34)	0.46 (0.94)	-3.1	0.002
Sleep disturbances	0.78 (0.41)	0.88 (0.32)	-1.2	0.221
Use of sleep-enhancing medication	0.16 (0.45)	0.27 (0.82)	-0.026	0.979
Daytime dysfunction	0.9 (0.66)	1.2 (0.81)	- 2.1	0.030

Notes: *p-value based on Mann-Whitney U-test. Values in bold indicate a $P < 0.05$. Data were presented by mean (S.D.).

Discussion

This study aimed to determine the prevalence of students with NES and the associations between NES, sleep quality and weight status among a sample of medical students at Kermanshah University of Medical Sciences in Iran. The results of this study showed that most of our participants did not meet the diagnostic criteria for NES. Only 0.8% (N=3) had NES according to the NEQ diagnostic cut-off point of 25. The sample in this study was similar to those in Yahia et al (2017)⁹ and Alwafa et al (2024),¹⁰ as all three studies used self-reporting in student samples despite different cultural and demographic contexts. Yahia et al (2017) found a small level of clinical NES in their sample at 1.2%.⁹ Alwafa et al (2024) reported that 82.6% of participants showed symptoms of NES, although they did not specify a clinical cutoff, only stating the presence of NES.¹⁰

The results also showed positive associations between NES and sleep quality. This was also consistent with Alwafa et al (2024) and Yahia et al (2017), who found a significant positive correlation between NES and the PSQI and its subcomponents.^{9,10}

Our results in this study also showed a significant difference between NES and overweight status. The mean score on the NEQ was higher in students who were overweight. The existing research on NES and BMI is mixed. Both Yahia et al (2017) and Alwafa et al (2024) report no association between NES and BMI within their student samples.^{9,10} Gallant et al (2012) demonstrated an association between NES and obesity, finding that the prevalence of NES was higher in overweight and obese samples seeking weight loss treatment or bariatric surgery compared to general population samples.¹⁹ On the other hand, several studies have investigated the association between NES and BMI, and the results appear to be contradictory. Some studies find a positive association,^{20,21} and others see no association.²² Sakthivel et al also noted these contradictory findings in their review study and attributed them to differences in assessment tools.²³ This

suggests that the complexities of NES and its interaction with various factors influencing BMI need further research. Future research should clarify these relationships and explore potential mediating factors.

This study also found a significant difference between sleep quality and overweight status. Those who were overweight were also more likely to have poorer overall sleep quality as well as various other aspects of sleep quality. This is unsurprising and well-documented in the literature.^{24,25} The mechanism for this is not fully understood, but sleep deprivation may lead to food cravings and hormonal and metabolic changes that promote weight gain and more likelihood of snoring and sleep apnea.²⁶

A meta-analysis study by Fatima et al (2016) found that poor sleep quality was associated with being overweight, and some studies suggest that this association is independent of sleep duration.²⁷ The negative consequences of poor sleep quality not only lead to physical problems such as obesity but also are associated with mental health problems.^{28,29} Therefore, assessing sleep quality and providing appropriate interventions for students, especially those who are overweight, can be effective in managing overweight and the consequences of insomnia.

Strengths and Limitations

This study offers several strengths. It is among the first to investigate (NES) specifically within the context of medical students in Iran. By focusing on medical students, the research addresses a unique demographic that may be particularly vulnerable to sleep disturbances and disordered eating behaviors due to the high demands and stress associated with their education. In addition, the relatively large sample of participants enhances the reliability and generalizability of the findings for Iranian medical students.

The study also has some limitations that should be mentioned. First, we used self-reported questionnaires to assess sleep quality and NES. Self-reported questionnaires are usually prone to over- and under-estimation, which affects the results. Secondly, we used cross-sectional data with correlation methods to understand associations between NES, sleep quality and BMI. Assessing these variables at multiple time points could help assess changes over time and potentially understand causal relationships with structural equation modeling. The third limitation of the study was the small sample size of NES and overweight participants, which may limit the reliability of subgroup comparisons. Finally, we used BMI to measure overweight and normal weight in this study. BMI cannot assess comorbid disease and related risk factors that may contribute to NES and sleep quality. Further research to overcome the limitations is recommended.

Practical Implications

Although the prevalence of NES was low in this specific study, the complexities of the syndrome and its association with BMI warrant attention, therefore, it is recommended that individuals who are overweight or meet the criteria for NES undergo assessment for sleep disorders. Additionally, psychotherapy and nutritional therapy programs are recommended to address NES and weight gain.

Conclusion

This study highlighted the interconnected relationships between NES, sleep quality (PSQI), and BMI among Iranian medical students. The overall prevalence of NES was low, with 0.8% of our sample meeting the clinical cutoff for NES.

We found that poor sleep quality, as measured with the PSQI, was significantly associated with NES. BMI was also significantly correlated with poorer sleep quality and NES.

Future research could use longitudinal study designs to clarify the directionality and causal pathways between NES, sleep quality, and BMI among medical students. Studies incorporating psychological (eg., stress, anxiety) and physiological assessments, as well as objective sleep measures, would help explain the underlying pathways linking these variables. Further intervention studies targeting sleep quality and stress management may determine whether improving sleep can reduce night eating behaviors and related weight outcomes.

Data Sharing Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

The study was conducted according to the Declaration of Helsinki and the ethical approval for the study was obtained from the Ethics Committee of Kermanshah University of Medical Sciences (IR.KUMS.MED.REC.1401.096). Participants were assured that their information would be kept confidential, and all completed written informed consent.

Acknowledgment

The authors wish to express gratitude to those who participated in this study.

Author Contributions

Nazanin Alghasi: conceptualization, data curation, software, writing - original draft. Ashley-Raye Miles: formal analysis, visualization writing – original draft, writing – review and editing. Amy Bender: formal analysis, visualization writing – original draft, writing – review and editing. Leeba Rezaie: conceptualization, project administration, supervision, methodology, writing – original draft, writing – review and editing. Nader Salary: methodology, conceptualization, data curation, formal analysis, writing – review & editing. Mahdi Aghajani: formal analysis, visualization writing – original draft, writing – review and editing. Habibolah Khazaie: conceptualization, project administration, data curation, methodology, supervision, writing-original draft. All authors took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

The study was supported by Kermanshah University of Medical Sciences, Kermanshah Iran, grant number 4020180.

Disclosure

The authors have no competing interests.

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